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PCT
INTERNATIONAL PRELIMINARY EXAMINATION REPORT
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 5818	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/IB 03/03049	International filing date (day/month/year) 04.07.2003	Priority date (day/month/year) 04.07.2003
International Patent Classification (IPC) or both national classification and IPC F16H48/30		
Applicant SAMUEL, Abraham		

<ol style="list-style-type: none"> This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36. This REPORT consists of a total of 6 sheets, including this cover sheet. <ul style="list-style-type: none"> <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT). These annexes consist of a total of 5 sheets. This report contains indications relating to the following items: <ul style="list-style-type: none"> I <input checked="" type="checkbox"/> Basis of the opinion II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

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Date of submission of the demand 14.07.2004	Date of completion of this report 01.09.2005
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Truchot, A Telephone No. +31 70 340-4782



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/IB 03/03049

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

- | | |
|--------|--|
| 1-3, 5 | as originally filed |
| 4, 4a | received on 20.04.2005 with letter of 18.04.2005 |

Claims, Numbers

- | | |
|------|--|
| 1, 2 | received on 20.04.2005 with letter of 18.04.2005 |
|------|--|

Drawings, Sheets

- | | |
|-----|--|
| 2/2 | as originally filed |
| 1/2 | received on 20.04.2005 with letter of 18.04.2005 |

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description, pages:
- the claims, Nos.:
- the drawings, sheets:

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5. This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1,2
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1,2
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1,2
	No:	Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/IB 03/03049

IAP20 Rec'd PCT/PTO 15 DEC 2005

Re Item I**Basis of the report**

The amendments filed with the letter dated 18.04.2005 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT. The amendments concerned are the following:

- description pages 4 and 4a (addition of new paragraph on page 4 from line 14 to line 17 included); and
- drawing sheet 1/2 (addition of new reference sign 25).

These amendments are not present in the original description and cannot be unambiguously deduced from figure 1. Indeed, the portion of the sleeve resting on the grooves of the cylindrical extension could exhibit inner grooves or splines which are not visible in the cross-sectional view of the differential assembly shown in figure 1.

As a consequence, the following examination has been carried out based on description page 4 and drawing sheet 1/2 as originally filed.

Re Item V**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following document (D2):

D2: US-A-2 620 055 (LOUIS FASULO) 2 December 1952 (1952-12-02)

The document D2 is regarded as being part of the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

A differential for motor vehicles, installed between two half-shafts (19) on which two drive wheels (21) are keyed, comprising a box (13) driven by the engine of the motor vehicle by means of the connecting means (15, 16) which cause it to rotate about the longitudinal axes of the said half-shafts, on the free ends of the latter there being keyed two bevel gears (not shown in D2) housed inside the box, and the differential and the half-shafts being contained inside a casing (11), each of the flanges (20) through which the half-shafts penetrate into the box having a cylindrical extension (23) outwards, at least the end of

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EXAMINATION REPORT - SEPARATE SHEET**

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which has a plurality of grooves (24) which are complementary with respect to other grooves (28) formed on the surface of a sleeve (26) slidable coaxially on each half-shaft and rotationally locked thereto, mounted inside the said casing and provided with means (29) which, when actuated, cause it to slide in two opposite directions causing engagement between the said grooves or disengagement thereof, respectively locking together the box and the half-shafts or performing disengagement thereof, wherein the external surface of the said sleeve has, formed in it, an annular slot (31) inside which there engages in a complementary manner a fork member (29) which is approximately semi-circular.

The subject-matter of claim 1 differs from this known differential in that:

- said other grooves are not formed on the surface of the sleeve, but on the surface of a coaxial cavity formed in the sleeve;
- said fork member is fixed to the casing and designed with dimensions so that the sleeve is able to slide with respect to the forked member in the two opposite directions so as to perform said engagement and disengagement of said grooves; and
- said fork member is fixed to the casing by means of two projecting parts which are aligned and pass through the casing, projecting on opposite sides of the casing, said two projecting parts being formed by two portions which can be connected together in a reversible manner.

The subject-matter of independent claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as to provide a differential allowing the easy extraction from the casing of a half-shaft and the sleeve which is mounted on it when necessary.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

In a first step, the fork member keeps the sleeve at its position within the casing when the half-shaft is extracted. In a second step, thanks to the reversible connection between the fork member and the casing, the sleeve and the fork member are extracted from the casing.

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The fork member shown in document D2 does not have the same function as the fork member described in claim 1 of the present application: indeed, the former causes the sleeve to slide while the latter supports the sleeve within the casing (and is designed in a way which does not interfere with the sliding movement of the sleeve). The skilled person would definitely not regard it as obvious to use the fork member known from D2 as a support member for the sleeve.

Claim 2 is dependent on claim 1 and as such also meets the requirements of the PCT with respect to novelty and inventive step (Article 33(2) and (3) PCT).

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instead of only mounting it, as in the example shown, from the end of the half-shaft 2 on which the associated drive wheel is keyed.

The sleeve 15 in question, which is housed inside the casing 8, has connected to it means - generically illustrated in the drawings and indicated by the reference number 16 - which, when actuated, cause it to slide in both the directions A, B, along the splined coupling 22, causing engagement between the said grooves 12i, 13i or disengagement thereof, and consequently rotationally lock or release the box 4 with/from the half-shaft 2 which, as mentioned, is in turn rotationally locked to the sleeve 15.

As shown in fig. 1, a flat (i.e. not grooved) portion 25 of the sleeve 15 rests coaxially on the grooves 12i of the said cylindrical extension 1s, or, more generally speaking, on this latter.

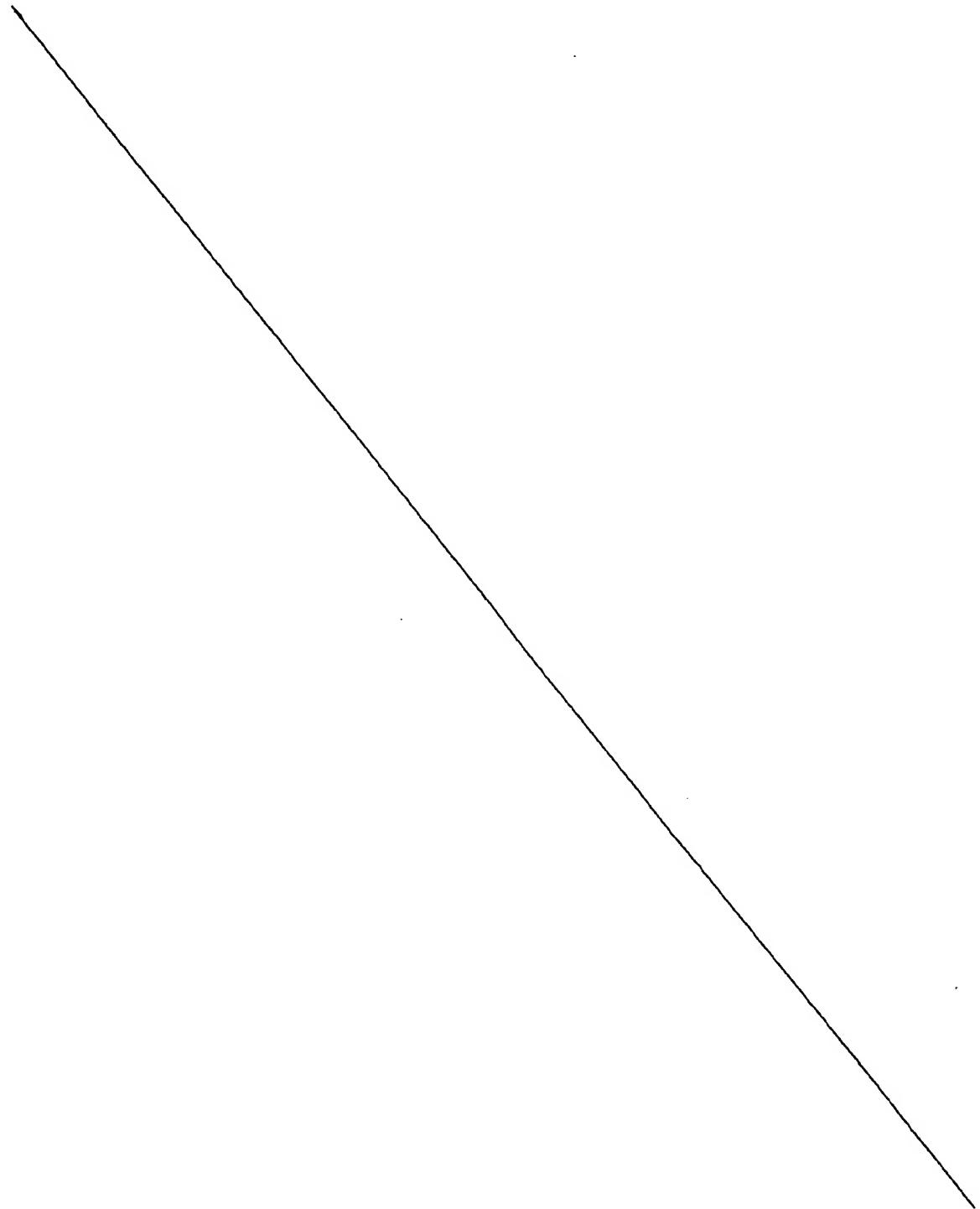
The said means 16 which perform the abovementioned function may be of widely varying types and preferably arranged inside the casing 8. They may consist, for example, of an electromagnet which can be excited externally and coupled to a resilient element which, upon deactivation of the electromagnet, causing engagement between the grooves 12i, 13i, brings the sleeve 15 back into its initial position, with the said grooves 12i, 13i disengaged from each other and with the differential operating normally without the locking action performed by the sleeve 15 (the component parts of this solution are not shown in detail).

In order to allow extraction of the casing 8 from the half-shaft 2 (arrow C, Figure 1) on which the sleeve 15 is mounted, without removal of the latter, the inventor has envisaged supporting the sleeve 15 by means of a fork member 18 with a substantially semi-circular shape (see also Figure 2 in this connection) which engages in a complementary manner with an annular slot 17 formed in the said sleeve and is also contained inside the casing 8 to which it is integrally fastened by means of two diametrically opposite projecting parts

4a

19, 20 which pass through it and emerge on the outside thereof.

In order to allow removal of the fork member 18 and the sleeve 15 which is supported by it when the



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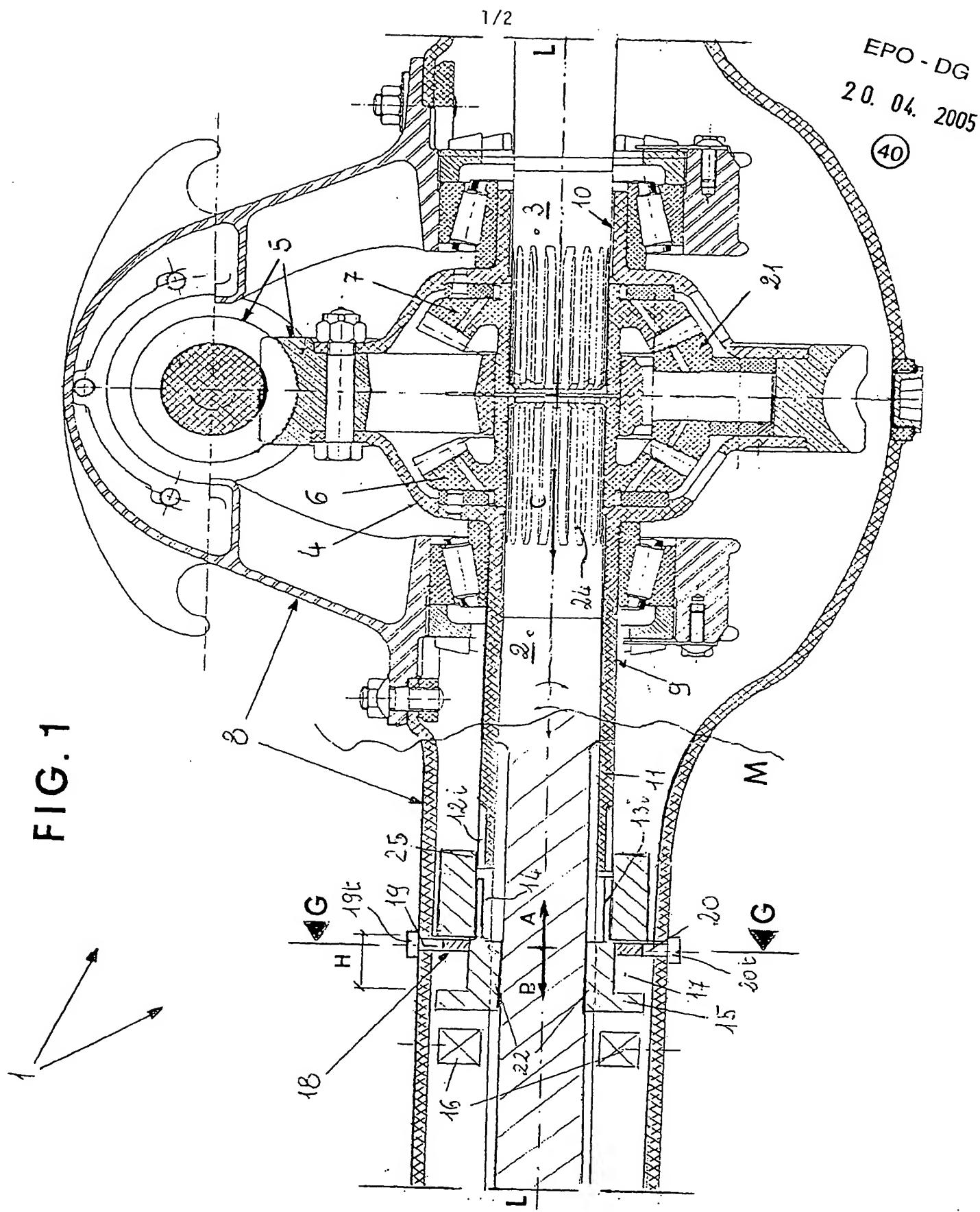
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Claims

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1. Differential (1) for motor vehicles, installed between two half-shafts (2, 3) on which two drive wheels are keyed, comprising a box (4) driven by the engine of the motor vehicle by means of the connecting means (5) which cause it to rotate about the longitudinal axes (L-L) of the said half-shafts (2, 3), on the free ends of the latter there being keyed two bevel gears (6, 7) housed inside the box (4), and the differential (1) and the half-shafts (2, 3) being contained inside a casing (8), each of the flanges (9, 10) through which the half-shafts (2, 3) penetrate into the box (4) having a cylindrical extension (11) outwards, at least the end of which has a plurality of grooves (12i) which are complementary with respect to other grooves (13i) formed on the surface of a coaxial cavity (14) formed in a sleeve (15) slidable coaxially on each half-shaft (2) and rotationally locked thereto, mounted inside the said casing (8) and provided with means (16) which, when actuated, cause it to slide in the two directions (A, B) causing engagement between the said grooves (12i, 13i) or disengagement thereof, respectively locking together the box (4) and the half-shafts (2, 3) or performing disengagement thereof, in which differential (1) the external surface of the said sleeve (15) has, formed in it, an annular slot (17) inside which there engages in a complementary manner a fork member (18) which is approximately semi-circular and fixed to the casing (8) and designed with dimensions so that the sleeve (15) is able to slide with respect thereto in the two directions (A, B) so as to perform the said engagement and disengagement of the said grooves (12i, 13i), characterized in that the said fork member (18) is fixed to the casing (8) by means of two projecting parts (19, 20) which are aligned and pass through it projecting on opposite sides, the said two projecting parts (19, 20) being formed by two portions (19s, 19t, 20s, 20t) which can be connected together in a reversible manner.

2. Differential according to Claim 3, in which
the said two portions (19s, 19t, 20s, 20t) of the
projecting parts (19, 20) are connected together by
means of a threaded coupling, and the outermost
5 portions (19s, 20s) thereof are essentially formed by a
plug which, pressing against the external surface of
the casing (8), produces a seal preventing the through-
flow of liquids.



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